In Re Japanese Priority Certificate(s)
For Japanese Patent Application No.: 11-2437
Date Filed: January 8, 1999

For: OMRON Corporation

<u>Translator's Declaration</u>

To Whom It May Concern:

Sir:

I, Hisamaru Hanada, hereby declare as follows:

1.   I am a citizen of Japan residing at c/o Takahashi, Hanada & Nagaya International Patent Co., Ambassador-Roppongi Suite 1003, 16-13, 3-chome Roppongi Minato-ku Tokyo 106 Japan.

2.   I am familiar with the Japanese and English languages.

3.   I prepared the attached English translation(s) for the above-captioned Japanese priority certificate(s) and to the best of my knowledge and belief it is a true and correct English translation of the Japanese original language.

4.   All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true.
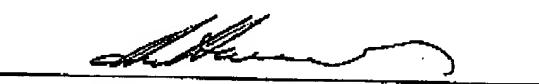
_____
Hisamaru Hanada
Dated this 20th day of December 2005

□Document Name□	Patent Application
□Identification No.□	57671
□Application Date□	Heisei 11 (1999) January 8
□Submit to□	Commissioner of Patent Office
□International Patent Classification□	H04N 1/40

□Inventor□

    □Address□   c/o Omron Corporation

                                   10 Tsujidou-cho, Hanazono, Ukyo-ku,

                                   Kyoto-city, Kyoto-fu Japan

    □Name□   Takashi KAKIUCHI

□Inventor□

    □Address□   c/o Omron Corporation

                                   10 Tsujidou-cho, Hanazono, Ukyo-ku,

                                   Kyoto-city, Kyoto-fu Japan

    □Name□   Junji HIRAISHI

□Inventor□

    □Address□   c/o Omron Corporation

                                   10 Tsujidou-cho, Hanazono, Ukyo-ku,

                                   Kyoto-city, Kyoto-fu Japan

    □Name□   Keitaro TANIGUCHI

□Inventor□

    □Address□   c/o Omron Corporation

                                   10 Tsujidou-cho, Hanazono, Ukyo-ku,

                                   Kyoto-city, Kyoto-fu Japan

    □Name□   Tomoji KAGATANI

□Applicant□

    □Identification No.□   000002945

    □Name□   Omron Corporation

    □Representative□   Yoshio Tateisi

□Agent□

    □ID No.□   100092598

    □Patent Attorney□

    □Name□   Shinichi Matsui

□Application Fee□

    □Pre-Paid Account No.□   019068

    □Amount□   21,000

□Documents submitted□

    □Document name□   Specification   1

    □Document name□   Drawing   1

    □Document name□   Abstract   1

    □General Power of Attorney□   9800459

□Proof read□   Required

[Document name]   Specification

[Title of the invention]   An Image Recognition Device, a recording medium, and an image processing apparatus using the same

[Claims]

1.   An image recognition device, comprising:

an element matching means to match a plurality of input pattern elements obtained by dividing an input image into a plurality of regions with the corresponding reference pattern elements of a reference pattern; and

a pattern detection means to detect a relative positions of said plurality of input pattern elements comparing with a reference arrangement data of said reference pattern elements in order to recognize said input image includes said reference pattern.

2.   An image recognition device, comprising:

a dictionary generating unit which stores dictionary data for each pattern element in a reference pattern;

an element matching unit, which compares and matches an input image pattern data which are input against said dictionary data stored in the aforesaid dictionary generating unit;

an arrangement data generating unit which stores the position data representing the arrangement of the reference pattern elements; and

a pattern detection unit, which, based on the output of said element matching unit and said position data from said arrangement data generating unit, determines whether the reference pattern can be found in said input image data.

3.   An image processing device, comprising:

an element matching means to match a plurality of input pattern elements obtained by dividing an input image into a plurality of regions with the corresponding reference pattern elements of a reference pattern;

a pattern detection means to detect a relative positions of said plurality of input

pattern elements comparing with a reference arrangement data of said reference pattern elements in order to recognize said input image includes said reference pattern; and

a control means to control to output said input image to the following device when said pattern detection means to recognize said input image includes said reference pattern.

4. A recording medium for an image recognition method, comprising:

an element matching means to match a plurality of input pattern elements obtained by dividing an input image into a plurality of regions with the corresponding reference pattern elements of a reference pattern; and

a pattern detection means to detect a relative positions of said plurality of input pattern elements comparing with a reference arrangement data of said reference pattern elements in order to recognize said input image includes said reference pattern.

[Detailed Description of the invention]

[0001]

[Industrial field]

This invention concerns an image recognition device, a recording medium and an image processing device which are ideally suited to prevent the counterfeiting of paper money, stock certificates, or similar documents. More specifically, it concerns an improvement of such a device for detecting the zoomed image.

[0002]

[Prior arts]

In recent years, the capabilities of full-color copy machines have become so sophisticated that it can be impossible to distinguish a copy from the original image with the naked eye. At the same time, access to such copying has become readily available. Thus the danger that copiers will be misused to counterfeit documents which may not legally be reproduced, such as banknotes and stock certificates, has also increased. Various devices have been developed to prevent such counterfeiting from succeeding.

[0003]

These devices record ahead of time a specific image of a banknote or other document which may not be reproduced, and they then determine whether the specific image exists in an input image which someone is attempting to copy. The method used to determine whether the image is recognized (i.e., pattern matching) entails evaluating the input image's distance from the template, or the relative correlation between a reference pattern (the template) and the input image the device is attempting to recognize (the object of recognition).

[0004]

If the device does recognize the target pattern in the input image, it employs any of various means to prevent copying, such as covering the paper entirely with black ink or halting the processing in progress.

[0005]

One of the essential elements in this sort of evaluation is that the two images must be exactly the same size. If the shapes in the two images are the same (i.e., the figures are similar) but their dimensions are different, the device will not recognize the image as the target pattern which is identical to the reference pattern. As a result, if someone were to use the copier's zoom function to reduce or enlarge the input image to be copied, the size of the image data which the image recognition device received from the copier would not match the reference pattern (the image data) stored in the device, and it would conclude that the original was not a banknote.

[0006]

A digital color copier normally reads the image loaded on the glass by moving an image sensor with one line of CCD (in the scanning direction) at a given speed. If the image has been reduced or enlarged, the speed of the image sensor can be increased or decreased correspondingly. This is necessary because the quantity of data in the feed direction which are received per unit of time will differ with the magnification.

[0007]

It is understood that humans recognize shape via a complex process; however, we are not as skilled at evaluating size, and recognizing (or discriminating) small differences in size is difficult for us. An item which is successfully copied because the image recognition device does not recognize its image as the same size as the reference image may nevertheless be indistinguishable to the human eye.

[0008]

If the magnification (either enlargement or reduction) is from several to ten percent, anyone can easily recognize a copy by comparing it directly with the original bill and seeing that it is the wrong size; but seeing only the copy makes it much more difficult. And if it is a bill one seldom sees, foreign currency, for example, the task is even harder.

[0009]

To address this problem, the image processing device disclosed in Japanese Patent Publication 6-237379 was developed. As preprocessing, this invention extracts

a specified portion (which varies with the magnification) of the input image data based on the magnification it receives from the copier. This process makes the resolution of the extracted image data is fixed at any magnification or zoom level. In this way the same processing can be executed in every subsequent unit without regard to the magnification so that the likelihood of recognition will not vary with magnification.

[0010]

[Problem Which This Invention Attempts to Solve]

The prior art device described above is effective for machines such as copiers which can transmit magnification or zoom data to it, but it cannot be used for machines which are unable to provide accurate magnification data. For example, an image processing system consisting of a scanner, a personal computer and a printer inputs, processes and reproduces the image by itself. This makes it difficult to obtain the sort of reliable index of magnification which a copier can readily provide. Thus the recognition processing employing magnification disclosed in the Patent publication 6-237379 cannot be applied to this sort of image processing system.

[0011]

The rapid development in recent years of electronic technology has improved the resolution of all the devices discussed above and enabled accurate full color printing. For this reason we must have a reliable way to halt the reading of the image containing the target pattern which is same as the reference pattern, the various types of processing involved, and the reproduction of the image.

[0012]

The present invention is developed in view of the background discussed above. Its objective is to provide an image recognition device, a recording medium, and an image processing device which will be capable of executing recognition processing accurately and evaluating the specified image even when the image data are the different size because the image has been magnified or reduced.

[0013]

[Means Employed to Solve This Problem]

To achieve the objectives outlined above, the image recognition device of this invention is designed as follows. It has a pattern element recognizing means to recognize the pattern elements obtained by dividing an input image into a plurality of regions comparing with the corresponding reference pattern elements, and a pattern detection means to detect the relative position of the pattern elements, which determines whether the pattern elements detected by the aforesaid pattern element recognizing means are arranged properly with respect to each other (Claim 1).

[0014]

Another means to solve this problem is configured as follows. It has a dictionary unit which stores dictionary data for each pattern element in the reference image; an element matching unit, which compares and matches the input image pattern data which are input against the data stored in the aforesaid dictionary unit; a storage unit for arrangement data (corresponding to "arrangement data generating unit 4"), which stores data representing the arrangement of the aforesaid pattern elements; and a pattern detection unit, which, based on the output of the aforesaid regional matching unit, determines whether the target pattern can be found in the aforesaid image data (Claim 2).

[0015]

The image processing device of this invention executes specified image processing on the image data. It has the recognition processing device disclosed in either Claim 1 or Claim 2. When this device recognizes the aforesaid target pattern in the image data being subjected to the aforesaid processing, it prevents the normal image processing from occurring (Claim 3). In the embodiment, this image processing device is realized by personal computer 12. Any device other than a personal computer which executes various image processing routines would also be considered an image processing device for the purpose of this invention, naturally including a copy machine. If used with an image processing device, such as a copier, which is＊ capable of providing a magnification value, the device may employ the magnification value to establish the arrangement data which will serve as the basis for comparison, or

it may establish these data without resorting to the magnification data from the copier.

[0016]

The recording medium of this invention contains an image recognition program which sends commands to the computer to execute processing to match the image data received against dictionary data for each element in the pattern and processing to determine whether the arrangement of the pattern elements detected by the aforesaid matching indicates the existence of the aforesaid pattern (Claim 4).

[0017]

In this invention, the reference pattern (i.e., the dictionary data) used to recognize the image consists of pattern elements obtained by dividing the pattern into a number of regions. The image is recognized by matching the image data which were input against these dictionary data. By executing image recognition independently for a number of regions consisting of a small quantity of data (i.e., the pattern elements), we can minimize the effect of the discrepancy which shows up in each region due to the change in scale when the input image has been magnified or reduced.

[0018]

If recognition is attempted using an entire pattern whose scale has been changed, the dimensional discrepancy (i.e., the discrepancy due to the number of elements) will be very great, and the pattern will not be recognized. But if recognition is executed on discrete pattern elements, the effect of the change in scale will be reduced, and the pattern can be recognized and detected.

[0019]

Using smaller regions to mitigate the effects of magnification or reduction will cause the recognition rate to drop because false positives will be detected in images whose pattern elements could have been detected correctly regardless of scale; such false positives can be avoided by tying recognition to arrangement data. This will minimize the drop in recognition rate due to a slight change in scale.

[0020]

[Preferred Embodiments of the invention]

We shall next give a detailed explanation, with reference to the appended drawings, of an ideal embodiment of an image recognition device according to this invention. As can be seen in Figure 1, dictionary data concerning the reference pattern to be detected are stored in dictionary generating unit 1. These dictionary data are obtained by dividing the reference pattern into a number of regions and storing each as a pattern element.

[0021]

For example, according to a prior art algorithm, the target pattern 5 shown in Figure 2 would be recorded in the dictionary as a reference pattern in its entirety. With this invention, the reference pattern is divided into a number of (here, six) regions, and dictionary data for each region are stored as pattern elements 5a through 5f.

[0022]

Using the dictionary data stored in dictionary generating unit 1, regional matching unit 2 executes matching processing on the input image. It sends the result of the matching to the next stage, pattern detection unit 3. For the dictionary data associated with the reference pattern in Figure 2, the six pattern elements 5a through 5f are read out (i.e., taken out of dictionary generating unit 1), and matching is executed with respect to each element. A determination is made as to whether the target pattern elements can be found in each input image. If it can, the matching results are sent, together with their position data, to pattern detection unit 3. In this case the data consist of a set indicating which pattern element was found in which location.

[0023]

In this embodiment, the location of the element consists of the coordinates of the center of the detected pattern element. In other words, regional matching unit 2 also has the capacity to detect this center location. Since the processing by which the input image data are matched against the individual reference pattern elements can be the same as that used in prior art devices, we will not provide a detailed explanation of it here.

[0024]

Based on the matching result it receives from regional matching unit 2 (the data as to the target pattern elements which match each of the pattern elements and the position data) and the arrangement data concerning reference pattern elements 5a through 5f which it receives from arrangement data generating unit 4, pattern detection unit 3 determines whether the pattern elements in the input image, which match all of the reference pattern elements, are in the proper locations. If they are, it concludes that the input image data that were received do contain the target pattern, and it outputs the result that the target pattern has been recognized.

[0025]

As can be seen in Figure 3 (a), the arrangement data stored in generating unit 4 consist of the relative position coordinates which are defined by the center positions a through f of pattern elements 5a through 5f. The pattern shown in Figure 3 (a) is identical to pattern 5, which is to say that it represents the arrangement data for a magnification of 100%. However, the arrangement data in this embodiment are not limited to 100% only. Data for other magnifications are stored as well. As can be seen in Figure 3 (b), arrangement data for a magnification of 115% consist of the relative position coordinates of center points a' through f', and arrangement data for a magnification of 95% consist of the relative position coordinates of center points a" through f".

[0026]

Data generating unit 4 outputs a magnification which was previously estimated or inferred from the input image data along with the arrangement data for those elements. The magnification is estimated from the magnification of the object to be recognized. In actuality, a number of magnifications are output sequentially. To infer the magnification based on the input image data, the technique disclosed in Japanese Patent Publication 9-132763 may be applied. If an accurate magnification value can be obtained from the exterior, as in the case of a copier, arrangement data appropriate for the given magnification are output.

[0027]

We shall next give a more detailed explanation of this invention while discussing the actual recognition processing. If original pattern or reference pattern 3 has the dimensions and shape shown in Figure 2, let us assume that there is an input pattern 6 to be recognized, as shown in Figure 4. Input pattern 6 has been magnified to 115% the size of the original target pattern 5. With this small difference, there is a real possibility that a person viewing the pattern could mistakenly think it is identical to target pattern 5.

[0028]

If a prior art image recognition method is used, the entire target pattern 5 in Figure 2 will be used as a reference pattern. When the reference pattern 5 shown by dotted lines in Figure 5 is matched against the actual input pattern 6, the size difference will cause a significant discrepancy, the resulting goodness of fit (the matching value) will be low, and target pattern 5 will not be recognized in the input pattern 6.

[0029]

With the current embodiment, as can be seen in Figure 6, each of the six reference pattern elements 5a through 5f is compared to the corresponding input pattern elements individually so that each is treated as a small independent region. The discrepancies caused by the magnification or reduction of the image will for the most part be limited within a given input pattern element because the comparison is conducted in each region of the pattern elements. This regional comparison can result a sufficient goodness of fit value in the matching process.

[0030]

For example, in the example shown in Figure 6, element matching unit 2 will detect all of input pattern elements 6a through 6f and extract the center coordinates (indicated by white circles in the drawing) for each element. It will then transmit these coordinate values along with a descriptive notation (a number) for each element to pattern detection unit 3 as the result of the recognition routine.

[0031]

Pattern detection unit 3 compares the coordinate values sequentially with the

plurality of reference arrangement data associated with each magnification which it receives from data generating unit 4. From this comparison, it determines whether the relative positional relationship of the input pattern elements that were detected matches the arrangement data for any of the magnifications, and so determines whether the input and reference patterns match. In the example shown in Figure 6, the relationship matches the arrangement data for a magnification of 115%, so it is determined that the detected input pattern matches the reference pattern. A result indicating this match is output from pattern detection unit 3.

[0032]

Resolution is one of the crucial elements in determining the presence of a pattern element. For example, when each comparison region is reduced for each input pattern element according to this embodiment, but elements 5a through 5f are changed to the higher resolution, then the detection can not precisely carried out. This is due to the following reason. The total number of pixels in an image will increase or decrease according to the magnification ratio. When one region of the image in reference pattern 5 contains a square with 100 pixels in it, the input pattern magnified to 115% will have 115 pixels. The magnified input patter of 115% will increase by 15 pixels. When that same pattern 5 is divided into ten equal segments, each segment will contain a square consisting of 10 pixels. So even though the entire input pattern has been magnified to 115% of its original size, and each input pattern element will consist of only 11.5 pixels, an increase of only one to two pixels. The input pattern elements can thus be detected in the reference pattern elements almost without any effect from the magnification, thus ensuring that both matching and detection can be accomplished with acceptable accuracy.

[0033]

In the other hand, if the reference pattern of the actual dimensions is divided into ten equal regions and the resolution is increased by, say, a factor of ten, each segment forming a pattern element will be a square containing 100 pixels. In this case, if the entire image is magnified to 115% of its original size, there will be fifteen extra

pixels in each segment, and the accuracy of detection will suffer.

[0034]

For this reason, the resolution of the pattern elements should be low enough such that no effect is experienced from a slight magnification. The discrepancy due to magnification should be kept within the range of accidental error in the input image. For our purposes, "slight magnification" refers to a low magnification which an ordinary person cannot discriminate or recognize with his naked eye. Magnification ratios large enough to distinguish with the naked eye need not be addressed. If the dimensions of the copy are obviously different from those of the original, so that a counterfeit banknote can easily be distinguished at a glance, there is no need for countermeasures

[0035]

With this sort of low resolution, the recognition rate with respect to individual pattern elements will not be very high enough. In other word, patterns which are not pattern elements will mistakenly be recognized. (This is why we cannot lower the resolution of the entire pattern as a whole and match it directly against the entire pattern). This drop in the recognition rate can be offset by recognizing a number of regions (i.e., pattern elements) at the same time and by using arrangement data concerning their relative arrangement to aid in the recognition.

[0036]

Figure 7 shows another example of a pattern to be recognized. The pattern 5 shown in Figure 2 consisted of a number of shapes, so it could easily be divided into elements; however, the invention is not limited to this sort of pattern only, but is also applicable for patterns like that shown in Figure 7, which do not lend themselves easily to being divided.

[0037]

The pattern shown in Figure 7 is continuous, so it would be difficult to divide it along the shapes in the pattern. It could, however, be divided using the mesh pattern in Figure 8 into twenty-five pattern elements 7a. The black circle in the center of each

element 7a marks its center position. If, as is shown in Figure 9, this pattern is enlarged, pattern elements 7a can all be moved slightly away from each other. The corresponding portions of pattern 9 can then be matched against the pattern elements, and the pattern will be recognized despite the magnification. The image recognition device for this purpose would be configured as in Figure 1.

[0038]

The pattern may be divided into elements using schemes other than a mesh. The pattern elements could, for example, be circular, which would make the effect of a change in scale isotropic. However, if the pattern is divided into circular pattern elements which are not overlapped, there will be gaps between the circles. To eliminate these gaps, we can create more elements to overlap the circles and cover these gaps. When overlapping elements are used, the accuracy of matching elements may be affected; however, this is an effective way to deal with a magnified or reduced image, since the overall accuracy will be enhanced. Hexagonal elements, which might be viewed as intermediate between round and square elements, could also be used to create a pattern like a honeycomb. In addition to those mentioned, any number of other shapes could also be used.

[0039]

Figure 10 shows an ideal embodiment of an image processing system in which an image processing device according to this invention is used. As can be seen in the drawing, in this image processing system the document is read by scanner 10, the image input device, and the resulting image data are sent to personal computer 12, the image processing device. Personal computer 12 executes the prescribed processing on the image data it receives and outputs the processed data to printer 14, the image generating device. Using the data it receives, printer 14 prints an image on the paper and outputs it.

[0040]

The processing executed by personal computer 12 might include changing the scale of the image, modifying it, correcting its color, or any of a variety of possible

operations. The image could also be stored in any of a variety of recording media instead of being sent directly to printer 14. The processing to enlarge or reduce the image need not be limited to personal computer 12. It could also be executed when scanner 10 reads the image or just before printer 14 outputs it. The image input device need not be a scanner. It could also be a digital camera (either still or video) or any of a variety of devices. The scheme used to input the image need not be limited to the use of an image input device like scanner 10, as described above. A recording medium such as FD or MO could also be used, or the image could be input electronically.

[0041]

In this embodiment, image recognition device 16 according to this invention is connected to personal computer 12. Image recognition device 16 has the configuration shown in Figure 1. It receives the input image data from personal computer 12 and executes the specified image recognition routine. If it determines that the image data it is processing contain the target image, it sends personal computer 12 a message indicating that result. When it receives such a message, personal computer 12 interrupts its normal image processing. It may simply stop processing the image, or it may reduce the resolution, cause the entire image to be a given color (for example, black), or superimpose a letter or mark on the image so that anyone can see at a glance that the bill is counterfeit or a copy.

[0042]

As is shown by the dotted lines in the figure 10, the result of recognition may be output either to personal computer 12 or to printer 14. Also, personal computer 12 is not the only possible source of the image data. They may also originate in scanner 10 or printer 14. In case the input image is received from scanner 10, the result of recognition may be sent directly to scanner 10.

[0043]

Personal computer 12 may have application software to execute the actual image processing. Image recognition device 16 may be a discrete device (including a

board) which is attached to personal computer 12, or it may consist of application software installed in personal computer 12. In this case, device 16 would be built into the personal computer 10 shown in Figure 10. In an image processing system, image recognition device 16 could be installed in scanner 10 or printer 14 at the user's discretion.

[0044]

In the discussion above, the arrangement data needed to deal with changes in the scale of the image are stored ahead of time in data generating unit 4. However, the invention is not limited to this scheme only. Alternatively, arrangement data for 100% of original size could be stored, and data for different magnifications could be generated by enlarging or reducing the image as needed for each image presented. The processing to accomplish this magnification or reduction could be also executed by pattern detection unit 3.

[0045]

In the embodiment discussed above, the program system was stored ahead of time in the personal computer, which was treated as a single device. However, the invention is not limited to this case only. There could be an application program which caused the computer to execute all the processing routines, and this program could be stored in a given storage medium.

[0046]

For example, as is shown in Figures 11 and 12, floppy disk (FD) 20 or CD-ROM 21 could be used as the storage medium. The program stored on storage medium 20 or 21 would then be installed in HD unit 25, which is connected to (or installed in) personal computer 24 via FD drive 22 or CD-ROM drive 23. In this way computer 24 will acquire the configuration discussed in the above embodiment.

[0047]

In this embodiment, the matching processing executed in element matching unit 2 and pattern detection unit 3 and the program which detects the center positions and determines the goodness of fit of the arrangement data could actually be installed

in HD unit 25. Then when they were needed, they could be transmitted from HD unit 25 to internal memory 26, where processing units 2 and 3 would be constructed. In this way all the processing could be executed at a high speed. The dictionary data in generating unit 1 and the arrangement data in generating unit 4 could also be realized in HD unit 25 or internal memory 26.

[0048]

If only a basic set of arrangement data is stored in data generating unit 4 and data are generated anew for each magnified or reduced image, this generating function may be performed by a program which is installed, like processing units 2 and 3 discussed above, in HD unit 25. When needed, this program would be transmitted from HD unit 25 to internal memory 26.

[0049]

[Effects of the Invention]

As is discussed above, the image recognition device, recording medium and image processing device according to this invention can recognize an image which has been distorted so that its size and/or shape differ from the original image. They do this by dividing the image into smaller elements and comparing each element with the corresponding element of a reference pattern. This approach absorbs the differences in size and shape and so allows the distorted image to be recognized. In addition to the data for each element of the image, data concerning the relative arrangement of the elements are also considered in the final determination of whether the data contain the target image. This use of relative position data effectively minimizes any detrimental effect the scheme might have on recognition rate.

[Brief Description Of The Drawings]

Figure 1 is a block diagram of an image recognition device which is a preferred embodiment of this invention.

Figure 2 shows an example of a reference pattern or target pattern to be recognized.

Figure 3 (a) shows an example of how the image might be divided into pattern elements (dictionary data).

Figure 3 (b) shows several examples of arrangement data.

Figure 4 shows an example of an input pattern to be compared with the reference pattern.

Figure 5 illustrates the difficulty experienced in the prior art.

Figure 6 illustrates how this embodiment works.

Figure 7 shows another example of a reference pattern to be recognized.

Figure 8 shows how the pattern in Figure 7 might be divided into pattern elements.

Figure 9 illustrates how recognition processing could be accomplished using the pattern elements shown in Figure 8.

Figure 10 shows a preferred embodiment of an image processing system containing the image processing device of this invention.

Figure 11 shows the configuration of a system in which the recording medium of this invention is implemented.

Figure 12 shows the configuration of a system in which the recording medium of this invention is implemented.

[Captions]

1.	Dictionary generating unit
2.	Regional matching unit
3.	Pattern detection unit
4.	Arrangement data generating unit
5, 7	Target pattern
5a-5f, 7a.	Reference pattern elements (small divided regions)
10.	Scanner
12.	Personal computer
14.	Printer
16.	Image recognition device

Abstract

[Object]   The objective is to provide an image recognition device, a recording medium, and an image processing device which will be capable of executing recognition processing accurately and evaluating the specified image even when the image data are the different size because the image has been magnified or reduced.

[Configuration]   To achieve the objectives, the image recognition device of this invention has a pattern element recognizing means to recognize the pattern elements obtained by dividing an input image into a plurality of regions comparing with the corresponding reference pattern elements, and a pattern detection to detect the relative position of the pattern elements, which determines whether the pattern elements detected by the aforesaid pattern element recognizing means are arranged properly with respect to each other.

[Selected Drawing]   Figure 1